822-1XRT, 882-EVDO

CDMA Serial Cellular Data Modem & IP Router

822-1XRT-XXX and 882-EVDO-XXX

CDMA Cellular Data Modem & IP Router

User Manual
001-0003-822
Revision 1; February 2008

Released February 2008

SECTION 1 – PREFACE 5
Copyright Notice 5
Modem Use 5
Interference Issues 5
Mobile Application Safety 6
SECTION 2 – PRODUCT OVERVIEW 7
Module Identification 7
General Description 7
Features and Benefits 7
Catalog Part Number Breakdown 7
External Connections 8
Front panel connections 8
Back panel connections 9
RS-232 Serial Port Integration Parameters 9
Accessories & Options 10
SECTION 4 – GETTING STARTED 11
Package Contents 11
Local PC Ethernet Configuration 11
Accessing the Modem's Homepage 13
Provisioning 14
Modem Network Connection 14
Local PC Serial Communication 16
SECTION 5 – PROVISIONING 18
Provisioning Information: Current Status 18
Activation: Manual-Entry Activation 19
Activation: OTASP and IOTA 19
SECTION 6 – CARRIER SPECIFIC PROVISIONING INFORMATION 20
Verizon Wireless Subscribers 20
Sprint PCS Subscribers 21
Alltel Subscribers 22
Telus (Canada) Subscribers 23
SECTION 7 – LAN CONFIGURATION 24
LAN Configuration 24
DNS Resolving 25
DHCP Configuration 25
PPPoE Setup 25
Remote Administration 29
SECTION 8 – PORT FORWARDING SETTINGS 30
Port Forwarding Support 30
Port Forwarding Configuration 30
SECTION 9 – ROUTING 32
RIP Routing 32
VRRP Configuration 32
Static Routes 33
SECTION 10 – SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP) 34
SNMP Configuration 34
SECTION 11 – DYNAMIC DNS 35
NO-IP Configuration 35
SECTION 12 – FIRMWARE UPDATE 37
Current Firmware Information 37
Download New Firmware 37
SECTION 13 – SERIAL SETTINGS 38
Serial Settings 38
PAD Settings 39
SECTION 14 – SERIAL INTERFACE COMMUNICATION 40

SECTION 15 – SPECIFICATIONS 44
General Specifications 44
Mechanical Specifications 45
SECTION 16 – ABBREVIATIONS 46
SECTION 17 – SERVICE AND SUPPORT 47
Product Warranty, RMA and Contact Information 47
RMA Request 47
Product Documentation 47
Technical Support 47
APPENDIX 1 – WARRANTY STATEMENT 48

SECTION 1 – PREFACE

Copyright Notice

©2008 CalAmp. All Rights Reserved.

This manual covers the operation of the CalAmp 822-1XRT and 882-EVDO Cellular Data Modem IP Routers. Specifications described are typical only and are subject to normal manufacturing and service tolerances.

CalAmp reserves the right to modify the equipment, its specification or this manual without prior notice, in the interest of improving performance, reliability, or servicing. At the time of publication all data is correct for the operation of the equipment at the voltage and/or temperature referred to. Performance data indicates typical values related to the particular product.

No part of this documentation or information supplied may be divulged to any third party without the express written consent of CalAmp.

Products offered may contain software which is proprietary to CalAmp. The offer or supply of these products and services does not include or infer any transfer of ownership.

Modem Use

The 822-1XRT and 882-EVDO modems are designed and intended for use in fixed and mobile applications. “Fixed” assumes the device is physically secured at one location and not easily moved to another location. Please keep the cellular antenna of the 822-1XRT/882-EVDO modem at a safe distance from your head and body while the modem is in use (see below).

Important

Maintain a distance of at least 20 cm (8 inches) between the transmitter’s antenna and any person while in use. This modem is designed for use in applications that observe the 20 cm separation distance.

Interference Issues

Avoid possible radio frequency (RF) interference by following these guidelines:

- The use of cellular telephones or devices in aircraft is illegal. Use in aircraft may endanger operation and disrupt the cellular network. Failure to observe this restriction may result in suspension or denial of cellular services to the offender, legal action or both.
- Do not operate in the vicinity of gasoline or diesel-fuel pumps unless use has been approved and authorized.
- Do not operate in locations where medical equipment that the device could interfere with may be in use.
- Do not operate in fuel depots, chemical plants, or blasting areas unless use has been approved and authorized.
- Use care if operating in the vicinity of protected personal medical devices, i.e., hearing aids and pacemakers.

- Operation in the presence of other electronic equipment may cause interference if equipment is incorrectly protected. Follow recommendations for installation from equipment manufacturers.

Mobile Application Safety

- Do not change parameters or perform other maintenance of the 822-1XRT/882-EVDO modem while driving.
- Road safety is crucial. Observe National Regulations for cellular telephones and devices in vehicles.
- Avoid potential interference with vehicle electronics by correctly installing the 822-1XRT/882-EVDO modem. CalAmp DataCom recommends installation by a professional.

SECTION 2 – PRODUCT OVERVIEW

Module Identification

Label Information

The label contains the CalAmp DataCom part number, serial number, FCC ID and the ESN numbers. The ESN number is required by your cellular carrier when activating your data contract. The ESN number is provided in decimal and Hex formats; format is dependent on your carrier type.

ESN Dec: The Electronic Serial Number of the cellular module in decimal format.

ESN Hex: Same number as above but in a special HEX format.

General Description

The 822-1XRT/882-EVDO Cellular Data Modem & IP Router from CalAmp is the ideal solution for a wide range of cellular data network serial and ethernet connectivity requirements.

The 822-1XRT modem version features CDMA 1xRTT speeds. The 882-EVDO modem version features CDMA 1xRTT and EV-DO Rev A speeds. The 822-1XRT/882-EVDO modem supports both circuit-switched and packet-switched services.

Features and Benefits

- 1xRTT Dynamic or Static IP (Mobile IP/DMU) – Carrier Dependent
- EV-DO Rev A data rates up to 3.1 Mbps (Rx) and 1.8 Mbps (Tx) (882-EVDO only)
- Inbound and Outbound Ethernet Routing
- Embedded Linux on ARM 9 processor
- Internet access and web browsing via Ethernet connector
- SNMP, PPPoE, RIP, and VRRP support
- DHCP Server and Inbound port mapping/translation (Port Forwarding)
- Modem Domain Names with Dynamic DNS
- Inbound IP termination with Static IP or Reverse DNS for lookup with Dynamic IP
- TCP/IP Packet assembler and dis-assembler for serial connected devices using ASCII
- Local or remote configuration using HTML web server or AT command set
- Dual Band Digital CDMA 800 MHz and CDMA PCS 1900 MHz
- Optional AGPS
- Diversity antenna (882-EVDO only)
- USB Host Controller

Catalog Part Number Breakdown

822-1XRT-XXX or 882-EVDO-XXX (XXX = Carrier Identifier)

VZW = Verizon Wireless
ALT = Alltel
SPN = Sprint
TMC = Telus (Canada)

External Connections

Front panel connections

Fig. 2.1 822-1XRT Front Panel

Panel Indicator	Connection	Description
SVC TYPE	Service Type	Solid = Higher speed service Blinking = Lower speed service Off = No service
TX/RX	Transmit/Receive	Indication of data transmission or reception activity
DCD	Data Carrier Detect	Signals router's connection on the cellular network
RSSI	Receive Signal Strength Indicator	Solid = strong Blinking = medium Off = poor
Serial	RS-232	Unit configuration alternative for serial-based data transfer
RF (SMA)	Antenna	Main RF antenna input
AUX(SMA)	AGPS Antenna	822-1XRT (optional connector installation)
AUX(SMA)	Diversity/AGPS Antenna	882-EVDO Diversity/AGPS antenna connector

Back panel connections

Fig. 2.2 822-1XRT/882-EVDO Back Panel

Panel Indicator	Connection	Description
Ethernet	RJ-45 Ethernet	Interface for Ethernet connection to devices through network hub or router
USB Host	USB	Interface for external devices (i.e., memory drives or GPS devices)
Reset		Momentary switch for unit reset
PWR LED		Power indicator
PWR Jack	2.1x5.5mm plug	Interface for power plug (9-28VDC)

RS-232 Serial Port Integration Parameters

Table 2.1 provides the serial cable design information to integrate the 822-1XRT/882-EVDO into your system.

Table 2.1 Standard RS-232 DE-9 Pin out

Pin	Name	Direction	Description
1	CD	«—	Carrier Detect
2	RX	«—	Receive Data
3	TX	—»	Transmit Data
4	DTR	—»	Data Terminal Ready
5	GND		System Ground
6	DSR	«—	Data Set Ready
7	RTS	—»	Request to Send
8	CTS	«—	Clear to Send
9	RI	«—	Ring Indicator

Note: Direction is DTE relative DCE.

Table 2.2 Default RS-232 Communication Parameters

Bits Per Second	115,200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Accessories & Options

Accessory / Option	Description	Order Number
Antenna	4" Rubber Duck Antenna 3" Mag Mount Antenna	L2-ANT0001 L2-ANT0003
Power Supply	110 VAC input DC Power Cable	L2-PWR0001 L2-PWR0002
Interface Cables	Serial Cable Ethernet cross-over cable	L2-CAB0002 L2-CAB0006
AGPS Option (822-1XRT only)	Installed AGPS antenna connector	823-7500-502

Primary Antenna

The primary and optional AGPS antenna connections on the 822-1XRT/882-EVDO modem are female connectors, therefore you must purchase an antenna with a SMA male connector. Do not select a SMA antenna with "reverse polarity" or RP-Male. When using a direct mount or "rubber duck" antenna, choose the antenna specific to your band requirements. Mounting options and cable lengths are user's choice and application specific.

AUX Antenna

The AUX antenna is a female SMA connector which can be optionally install on the 822-GPRS modem to be used for AGPS.

The AUX antenna connector is installed as standard on the 882-EVDO modem and can be used for Diversity, AGPS, or both depending on the antenna attached and the modem programming. The modem, by default, sets the AUX input as a Diversity antenna.

SECTION 4 – GETTING STARTED

The 822-1XRT/882-EVDO modem can be configured via HTML web pages or AT commands on the serial port. You will need a CDMA Cellular account. For TCP/IP please request a 1xRTT (822-1XRT) or EVDO (882-EVDO) Account with Mobile IP and optionally Static IP or Simple IP (SIP). This is carrier dependent.

The modem is configured with default settings and is ready to be configured via HTML. You may need to activate the modem with your carrier to start using it. The default settings are programmed for most operations.

Package Contents

- 822-1XRT/882-EVDO cellular data modem (specific to CDMA cellular provider)
- Information Card

Local PC Ethernet Configuration

The 822-1XRT/882-EVDO modem is configured via the Internet which automatically allows your computer to obtain the proper IP address. For Windows XP users, select Start -> Control Panel -> Network Connections. Right click “Local Area Connection” and select “Properties” to open the configuration dialog box for Local Area Connection. See Figure 4.1.

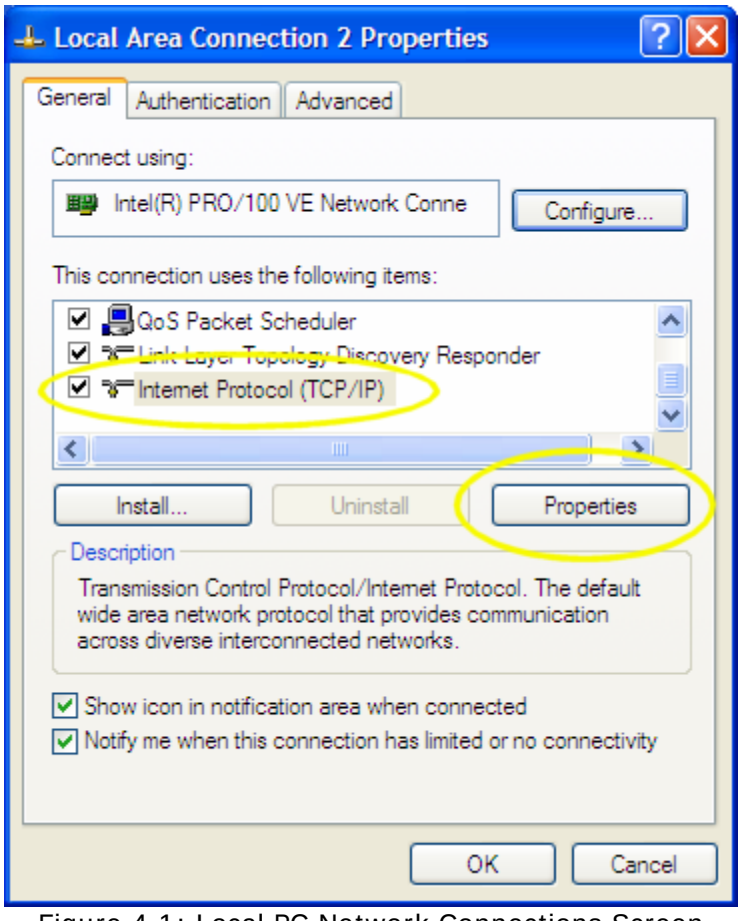


Figure 4.1: Local PC Network Connections Screen

Find and select "*Internet Protocol (TCP/IP)*" from the list box and then click the "*Properties*" button (Figure 4.1). The TCP/IP configuration window will pop up, refer to Figure 4.2. Under the General tab, select radio button "*Obtain an IP address automatically*" and "*Obtain DNS server address automatically*" (Figure 4.2). Click the OK button to close TCP/IP configuration window. Click the Close button to complete the computer preparation for the 822-1XRT/882-EVDO modem.

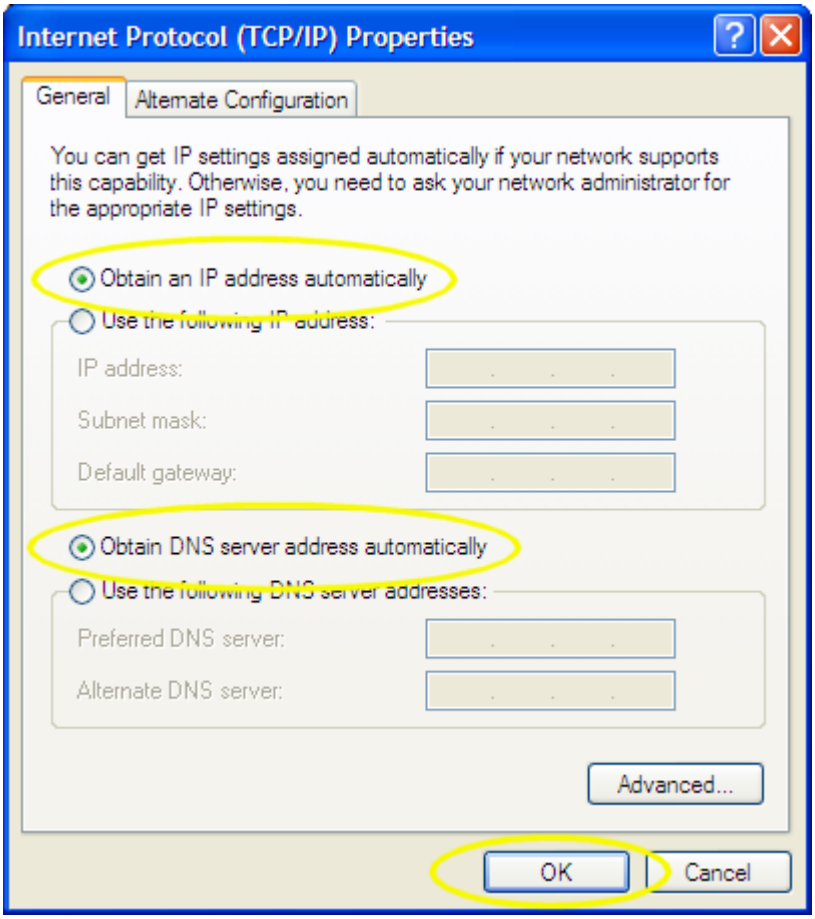


Figure 4.2: Internet protocol (TCP/IP) properties screen

Connect an antenna to the RF connector on the front panel of the 822-1XRT/882-EVDO modem. Connect the Ethernet cross-over cable into the 822-1XRT/882-EVDO modem's Ethernet Port and plug the other end into the network port of your PC. Connect the Power Adapter to the 822-1XRT/882-EVDO modem and plug into a proper AC power socket. The Power LED on the panel should activate. The Service LED (SVC TYPE) and RSSI LED will light green to indicate the 822-1XRT/882-EVDO has finished starting up and is functioning.

Accessing the Modem's Homepage

Start your web browser and enter **192.168.1.50** in the address bar. A login screen should appear, enter the User Name: **admin** and the Password: **password** and click OK. Refer to Figure 4.3.

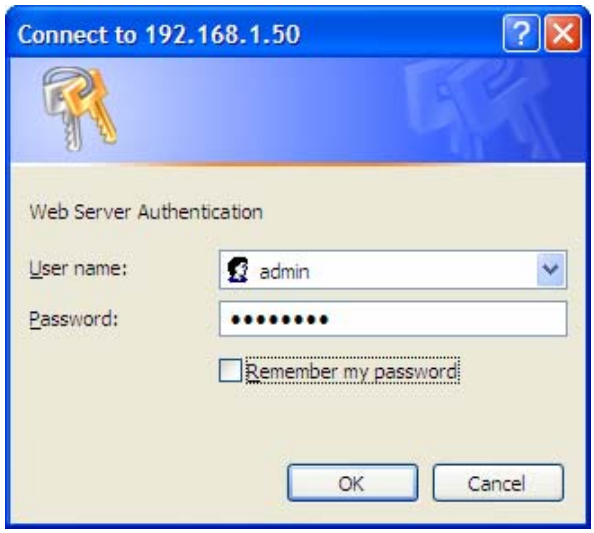


Figure 4.3: 822-1XRT/882-EVDO browser connection login screen

Figure 4.4: 822-1XRT/882-EVDO configuration Home page

The PPP status on the Home page will show DOWN because the new device is not enabled. Also, the MDN/MTN or MIN/IMSI lines may show an invalid phone number indicating that the unit has not

been provisioned. The modem must first be provisioned with the specific carrier before connecting with the cellular network.

Provisioning

In order to use the modem, it must be activated by the specific carrier once the ESN has been provided for the account. Over-The-Air (OTA) activation is supported and each carrier has a different procedure. Refer to **Sections 5** and **6** for information on provisioning for specific carriers.

Modem Network Connection

After the modem has been successfully provisioned, the cellular data connection can be enabled. At the Home page, select "**Data Connection**" from the side menu bar. Fill out the Dial Number, User, and Password fields required for the specific carrier account. The default values for Verizon and Sprint are shown in Figure 4.5, a dial number of **atd#777** and blank username and password. Select "**Enable**" on the Auto Connect line and then click the **Save** button.

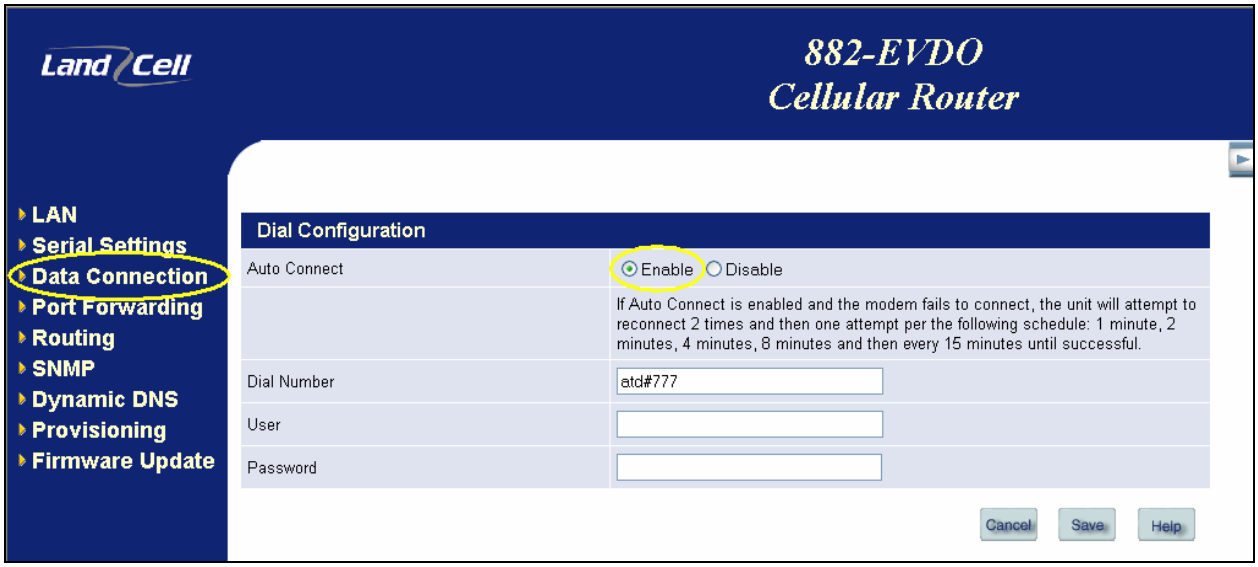


Figure 4.5: Data Connection configuration page

The DCD LED on the front panel will light when a connection to the cellular network has been established. Go back to the Home page to verify the PPP Status is UP (Figure 4.6). The PPP IP Address field shows the current IP address the network has assigned the 822-1XRT/882-EVDO device as well as other PPP parameters.

Figure 4.6: 822-1XRT/882-EVDO successful connection parameters

The 822-1XRT/882-EVDO modem is ready to browse the web. More detailed configuration information and activation of other features of the 822-1XRT/882-EVDO modem are given in the following sections.

Local PC Serial Communication

The 822-1XRT and 882-EVDO modems allow AT command communication through the serial port. Below is a quick guide on setting up the serial parameters and acquiring IP information without using the Ethernet connection. More information can be found on serial communication in **Section 14**.

1. Connect the modem to an active COM port on a PC with an RS-232 9 pin straight through cable.
2. Attach the antenna and power connector.
3. Connect with a Hyper-Terminal session set to 115,200, 8 Bits, No Parity, 1 Stop Bit, and Hardware Flow Control enabled. Refer to Figure 4.7.

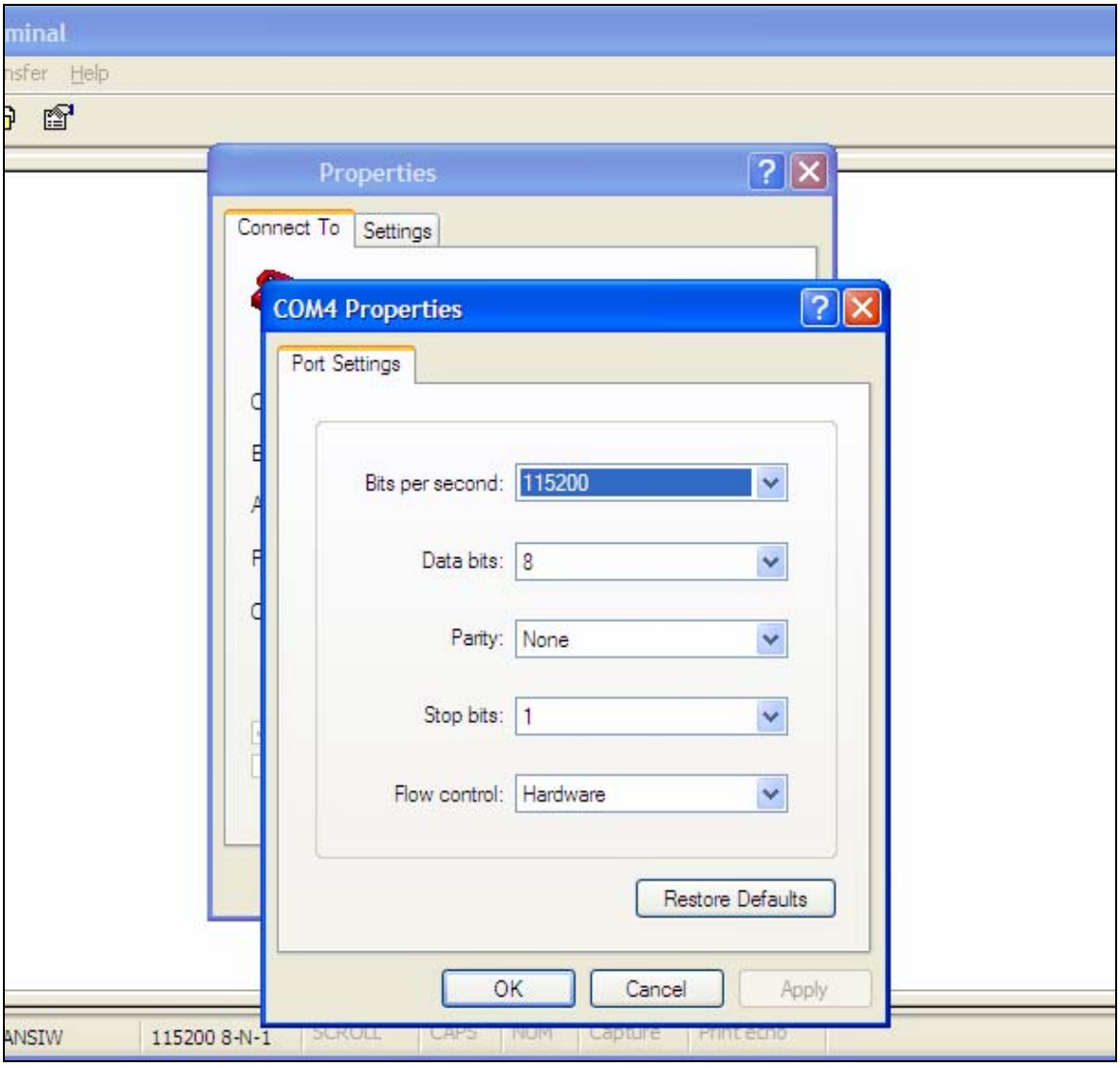


Figure 4.7: HyperTerminal Port Settings

4. Type the **ATI** command in Hyper-Terminal to confirm contact with the modem. This prints the modem's part number family and the firmware revision level, see example output for an 882-HSDP modem below:

```
Land Cellular CDM-882 (Revision 1.19.0)
```

5. Type the **AT+LCIFCG?** command to check the IP address and the MAC address of the modem. The “eth0” section shows the statistics for the Ethernet jack. For example, in Figure 4.8, HWaddr 00:11:DB:00:88:A6 is the MAC address and inet addr:192.168.1.50 is the IP address of the modem (the default address used to connect to the modem).

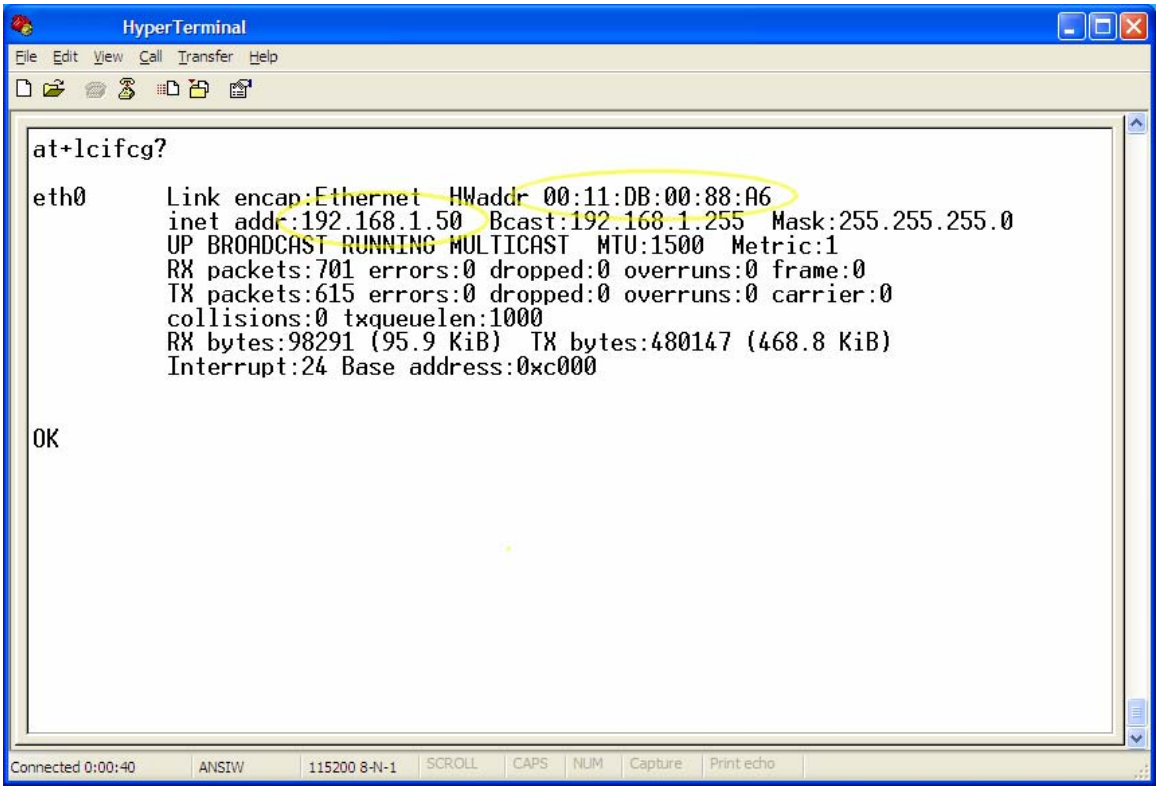


Figure 4.8: Modem Ethernet information

SECTION 5 – PROVISIONING

Selecting **Provisioning** from the left menu bar brings up the provisioning activation page. When a new modem is powered up for the first time, most of the provisioning information is blank or has information that needs to be changed. The device is usually shipped with the radio ready to be provisioned on a cellular carrier's network. Features called Over-The-Air Service Provisioning (OTASP) and Internet Over-The-Air (IOTA) are supported, which allow the cellular providers to program the modem with specific information to activate the account.

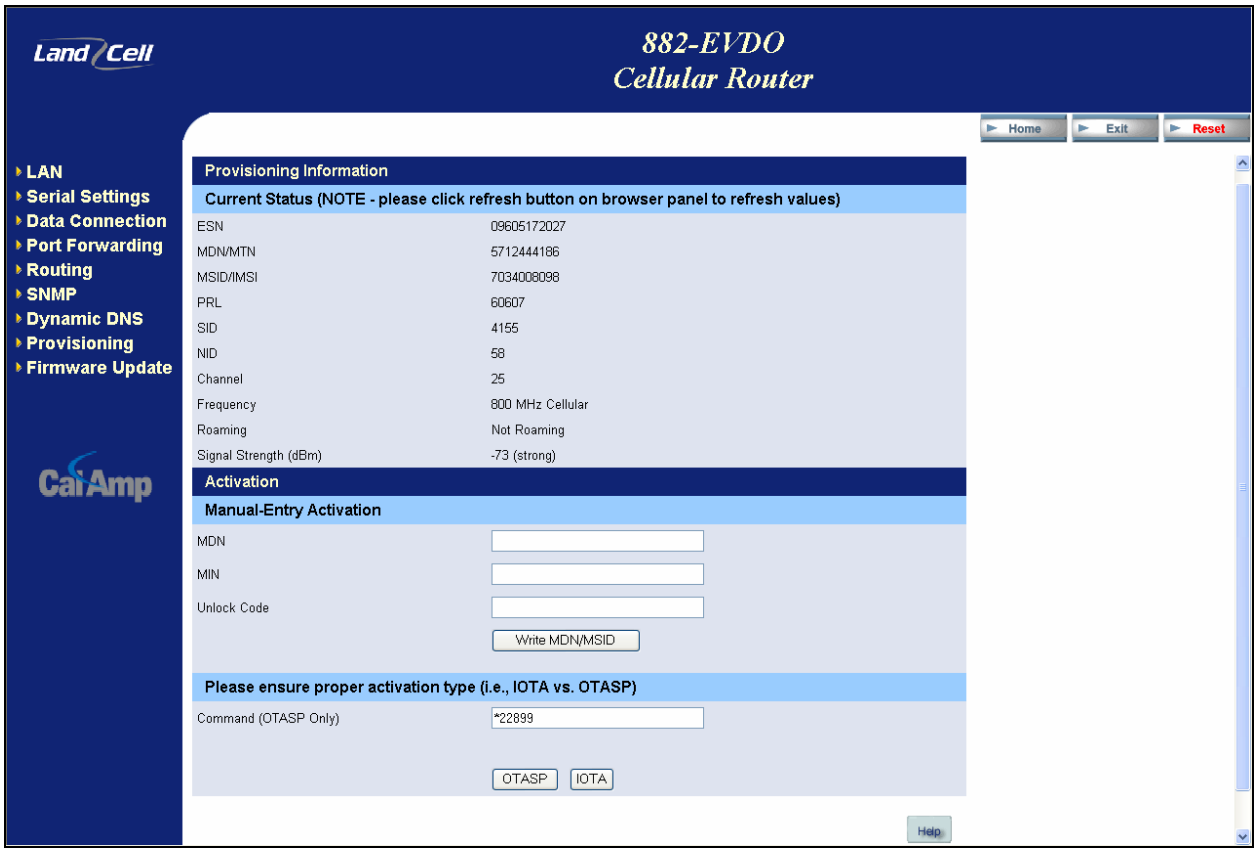


Figure 5.1: Provisioning page

Provisioning Information: Current Status

ESN:
The Electronic Serial Number is only applicable for the CDMA product line, carrier specific (AllTel, Verizon, Sprint, etc). This number is used to set up the user account with the cellular provider.

MDN/MTN:
This is the actual phone number of the device as supplied by the carrier. When the unit is successfully provisioned, the phone number for the user account will be displayed.

MIN/IMSI:
This number is used by the Mobile Telephone Network and will be different if ported from another carrier (not used by end user of the device).

PRL:
Preferred Roaming List, only applicable for the CDMA product line, carrier specific (AllTel, Verizon, Sprint, etc).

SID:
System ID (Identity), provided by the Carrier.

NID:
Network Identifier, this is supplied automatically from the network.

Channel:
Cell Site channel number to which the modem is connected. This number can be useful to the cellular provider for troubleshooting purposes.

Frequency:
Cellular frequency band the modem is using, 800MHz and 1900MHz are mainly in the US and outlying areas. In some cases 900 and 1800 will be seen for European or Foreign carriers.

Roaming:
Options are either Roaming or Not Roaming and may defer from the PRL in the case of CDMA. For provisioning, the unit must **NOT** be roaming.

Signal Strength (dBm):
Measured in dBm, this is the Received Signal Strength Indicator (RSSI). For provisioning, the signal strength should be greater than -95 dBm.

Activation: Manual-Entry Activation

MDN:
The Mobile Directory Number assigned by the cellular provider for the specific ESN on the user account.

MIN:
Mobile Identification Number, which only needs to be entered if different than the MDN.

Unlock Code:
A carrier supplied activation code (usually 6 or 7 digits for Sprint accounts).

Click the Write MDN/MSID button when the required information has been entered.

Activation: OTASP and IOTA

Command (OTASP Only):
This is the dial command used for provisioning the modem. For Verizon OTASP the number is *22899. For IOTA this field should be left blank.

Click the OTASP or the IOTA button (depending on the carrier) to start the provisioning process. Please refer **Section 6** for information on provisioning the modem for various cellular providers.

SECTION 6 – CARRIER SPECIFIC PROVISIONING INFORMATION

Refer to **Section 5** for more information about the Provisioning page.

Verizon Wireless Subscribers

- Provisioning must occur in a non-roaming area of the Verizon network with a medium to strong signal strength.
- Select "**Provisioning**" from the side menu bar.
- Confirm the OTASP command reads ***22899**.
- Click the "**OTASP**" button.

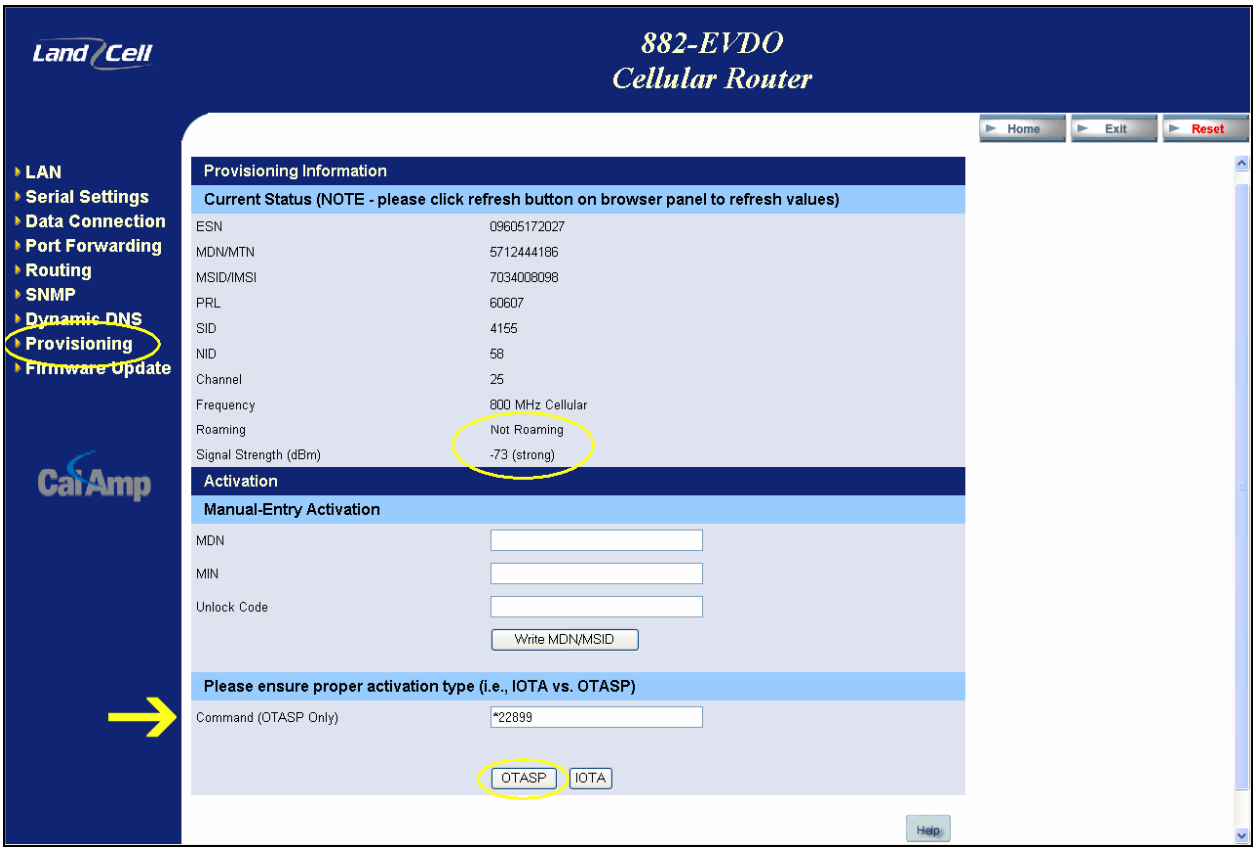


Figure 6.1: Verizon Provisioning Page

Sprint PCS Subscribers

- Provisioning must occur in a non-roaming area of the Sprint network with a medium to strong signal strength.
- Select "**Provisioning**" from the side menu bar.
- Input the MDN, MIN, & Unlock Code from your provider
- Click the "**Write MDN/MSID**" button.
- Confirm the command for OTASP is blank.
- Click the "**IOTA**" button.

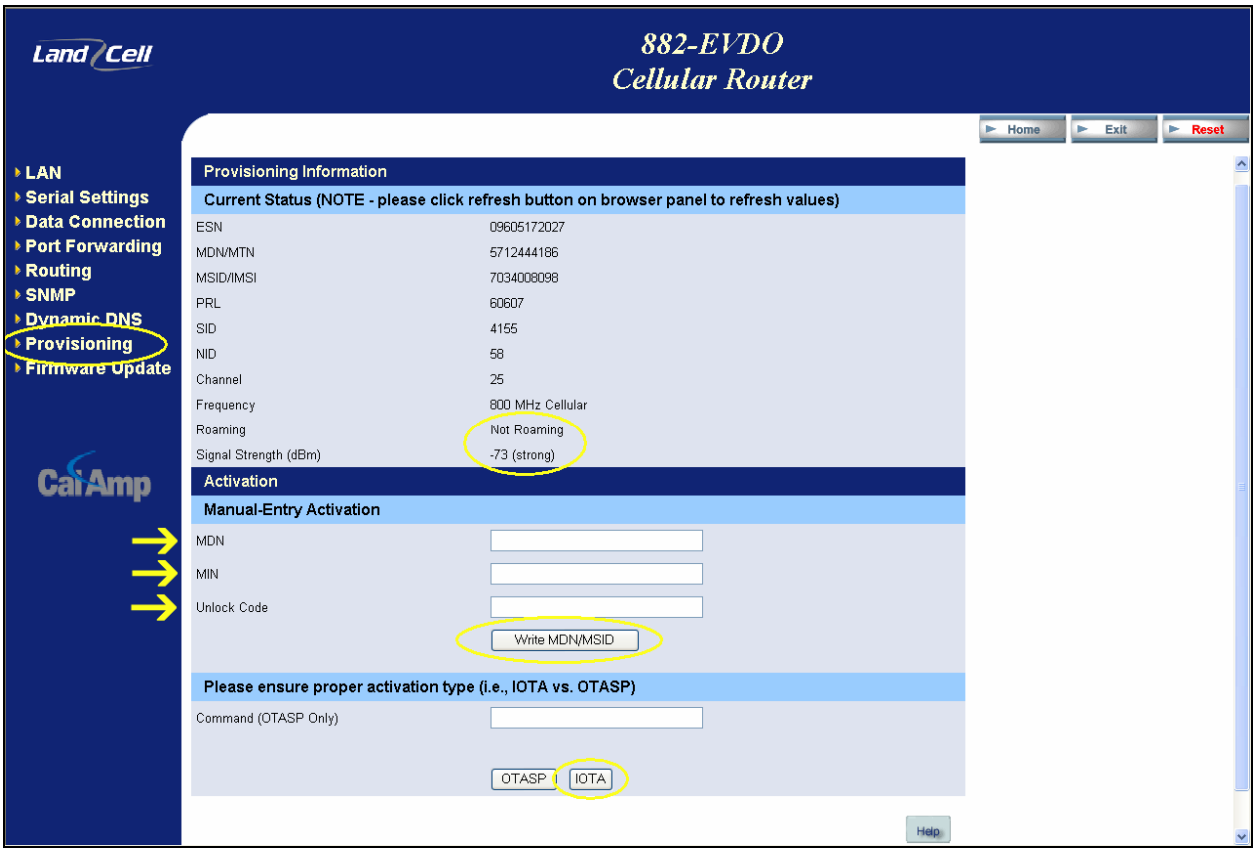


Figure 6.2: Sprint Provisioning Page

Alltel Subscribers

- Provisioning must occur in a non-roaming area of the Alltel network with a medium to strong signal strength.
- Select "**Provisioning**" from the side menu bar.
- Confirm the command for OTASP is blank.
- Input the MDN and MIN from your provider
- Click the "**Write MDN/MSID**" button.
- Reset the unit from the Home page.

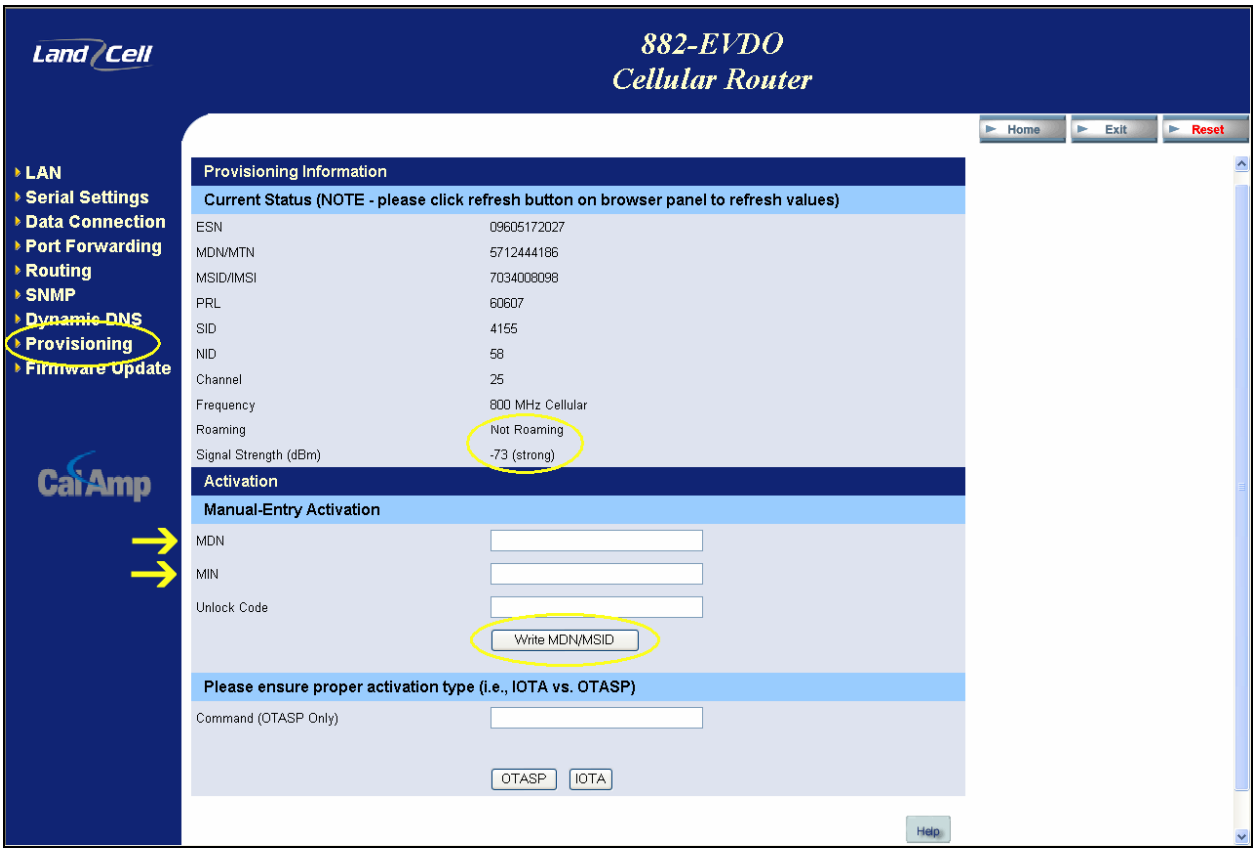


Figure 6.3: Alltel Provisioning Page

Telus (Canada) Subscribers

- Provisioning must occur in a non-roaming area of the Telus network with a medium to strong signal strength.
- Select "**Provisioning**" from the side menu bar.
- Confirm the OTASP command reads ***22803**.
- Click the "**OTASP**" button.

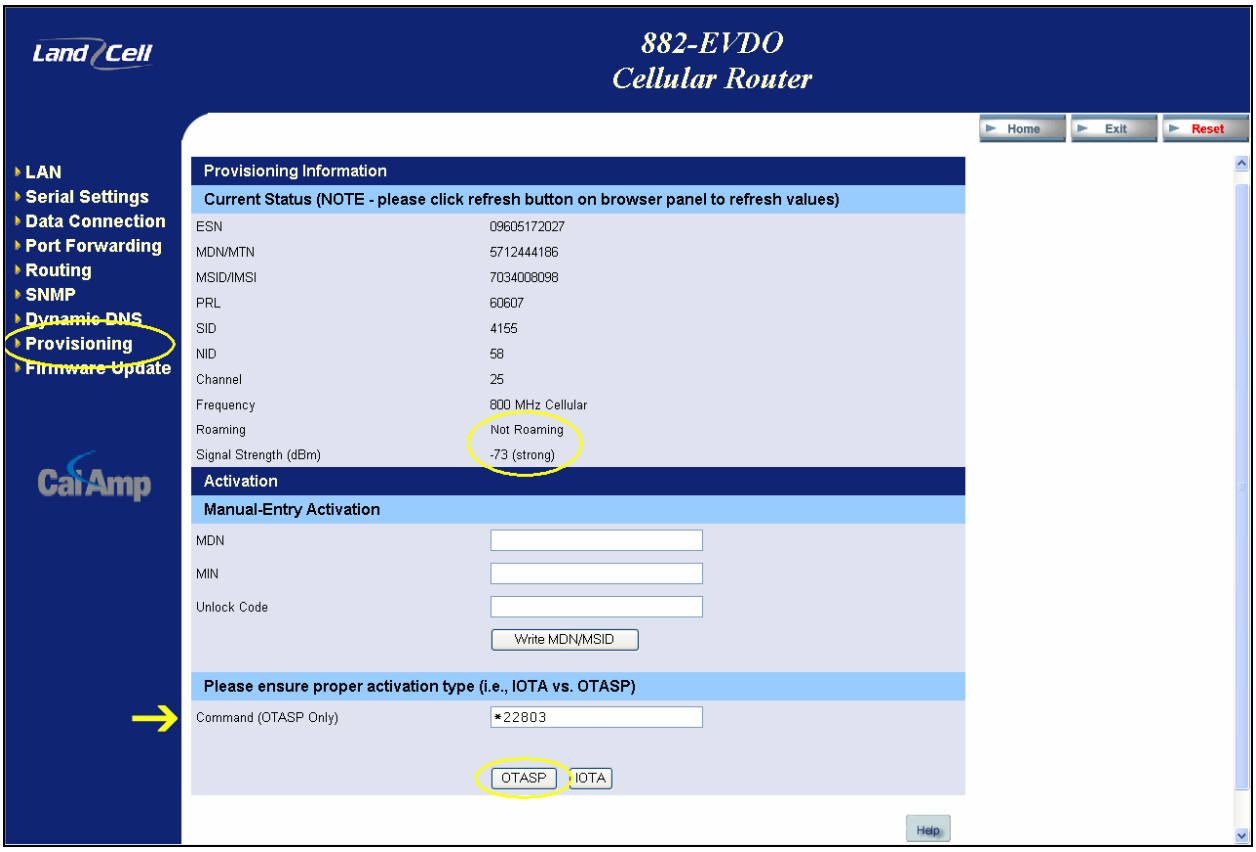


Figure 6.4: Telus Provisioning Page

SECTION 7 – LAN CONFIGURATION

Selecting **LAN** from the left menu bar brings up the LAN configuration page. From this page the modem's IP address, DNC settings, DHCP settings, PPPoE enable/disable, and Remote Administration parameters are configured. Refer to Figure 7.1 below.

Figure 7.1: LAN configuration page

LAN Configuration

Ethernet IP Address:
This sets the IP address of this device and is the address used to access the configuration pages. If the IP address changes you will have to re-enter the new IP address in your browser to access the configuration pages. The default IP is 192.168.1.50 and should be changed for security purposes.

Ethernet Subnet Mask:
This sets the subnet mask for the LAN side of the modem to the device. The default subnet mask is set to 255.255.255.0.

DNS Resolving

DNS Auto:
Selecting Enable will automatically set DNS Server 1 to the Ethernet address set in the LAN configuration section. Selecting Disable will allow different DNS server IP addresses to be set.

DNS Server 1 IP Address:
Ethernet IP address of the preferred DNS server.

DNS Server 2 IP Address:
Ethernet address of the alternate DNS server.

DHCP Configuration

DHCP:
Dynamic Host Configuration Protocol; a protocol used by client devices that are connected to the LAN port of this device to automatically obtain an IP address assigned by this device. Selecting Enable will configure this device to assign IP addresses to client devices taken from a pool specified by the values entered in DHCP start range and DHCP end range. Selecting Disable will turn off the DHCP server functionality.

DHCP start range:
DHCP server starting IP address. The default start range is set to 192.168.1.100.

DHCP end range:
DHCP server ending IP address. The default end range is set to 192.168.1.200. The largest settable number is 253.

DHCP Lease Time:
Sets the duration, in seconds, the connected device is allowed to keep the assigned IP address. The default lease time is set to 86400 seconds (24 hours). In many cases it is possible for the device to receive the same IP address after the lease time expires.

PPPoE Setup

PPPoE:
Point To Point Protocol over Ethernet is used to establish internet connections using the Ethernet. Selecting Enable will allow a PPP over Ethernet connection. Selecting Disable will shut off PPPoE functionality. Click on the "**Save**" button to change the LAN settings.

Note that when PPPoE is enabled, the DHCP Server is automatically disabled. If the DHCP server is enabled again after the PPPoE is disabled, the IP parameters will need to be re-entered.

After PPPoE has been enabled, a broadband connection can be created on the PC side. The following steps show how to create a broadband network connection in Windows XP.

First, go to the Control Panel and select "*Network Connections*" to bring up the Network Connection window (Figure 7.2).

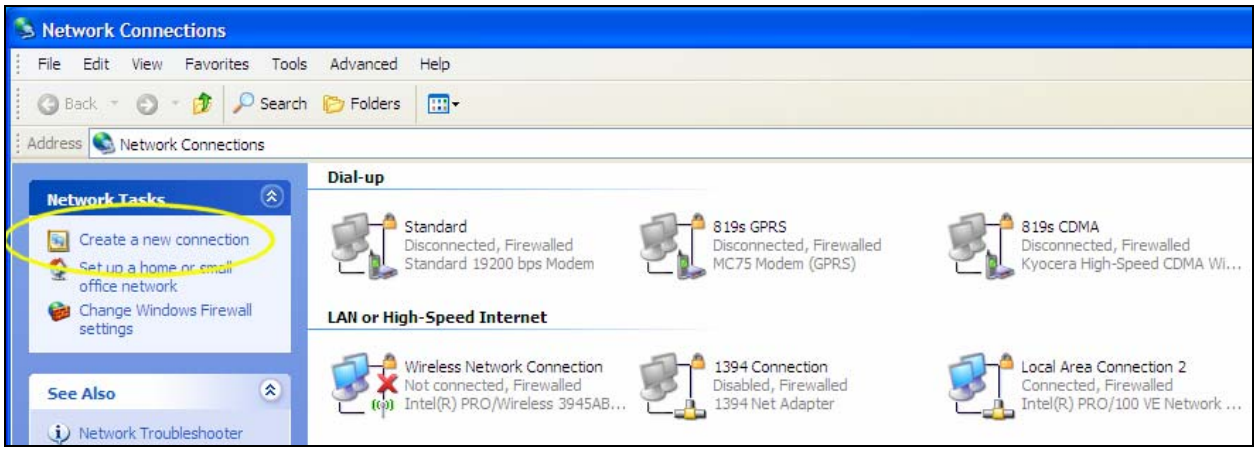
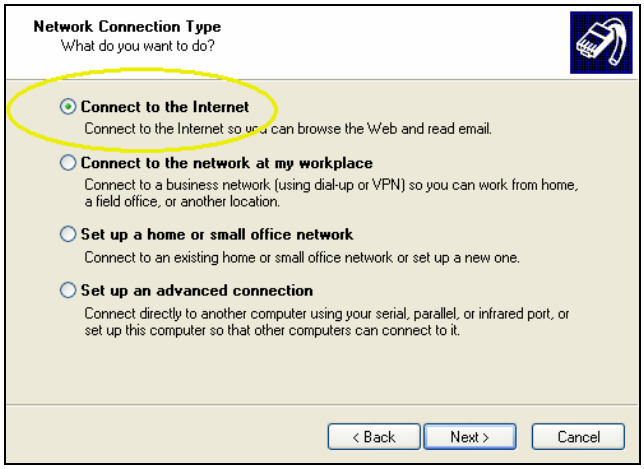
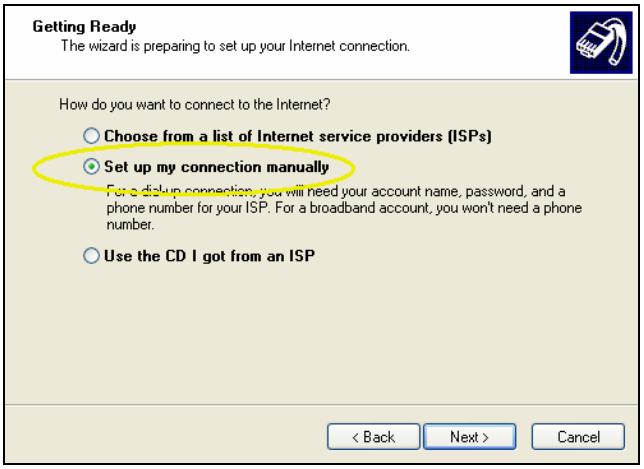
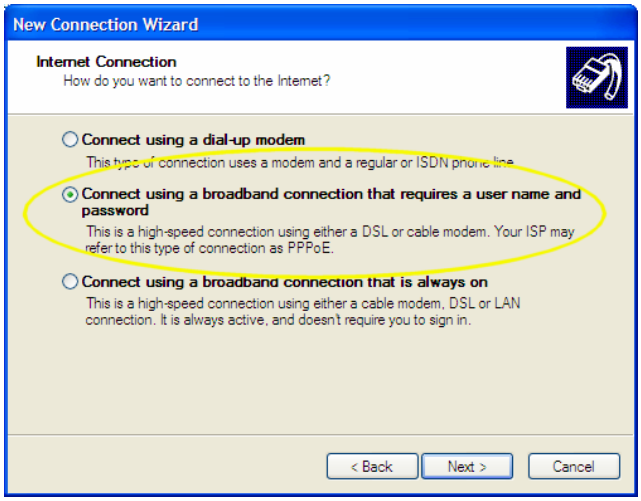


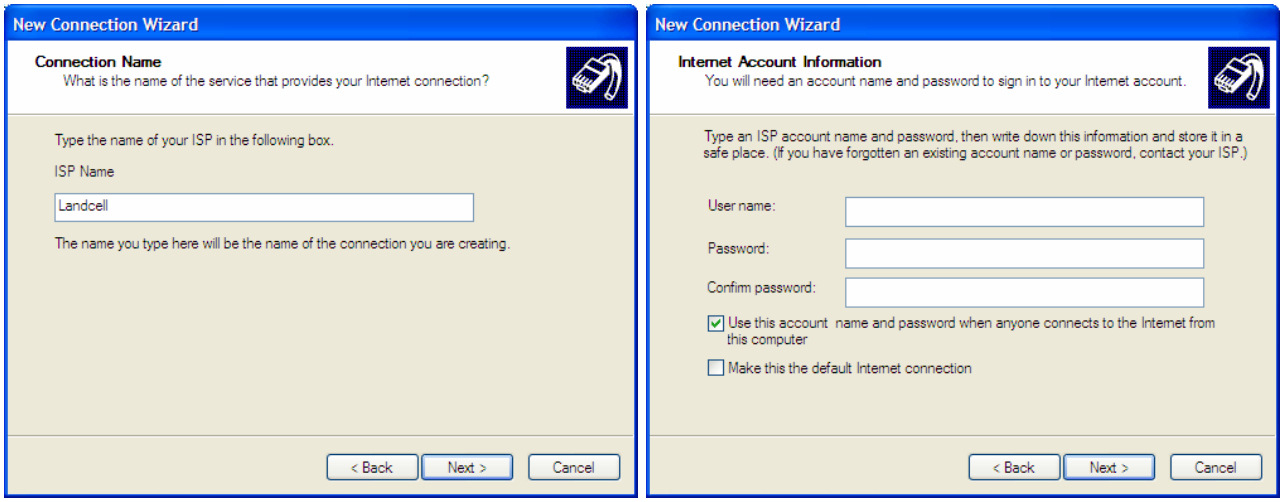
Figure 7.2: Network Connection screen

Select "*Create a new connection*" in the Network Tasks menu. Follow the steps through the wizard for creating a broadband internet connection.









Provide an ISP Name to identify this connection. If your carrier requires a username and password, enter them here, otherwise leave these entries blank.

After finishing the wizard, a Broadband connection icon will appear on the Network Connections window as shown in Figure 7.3.

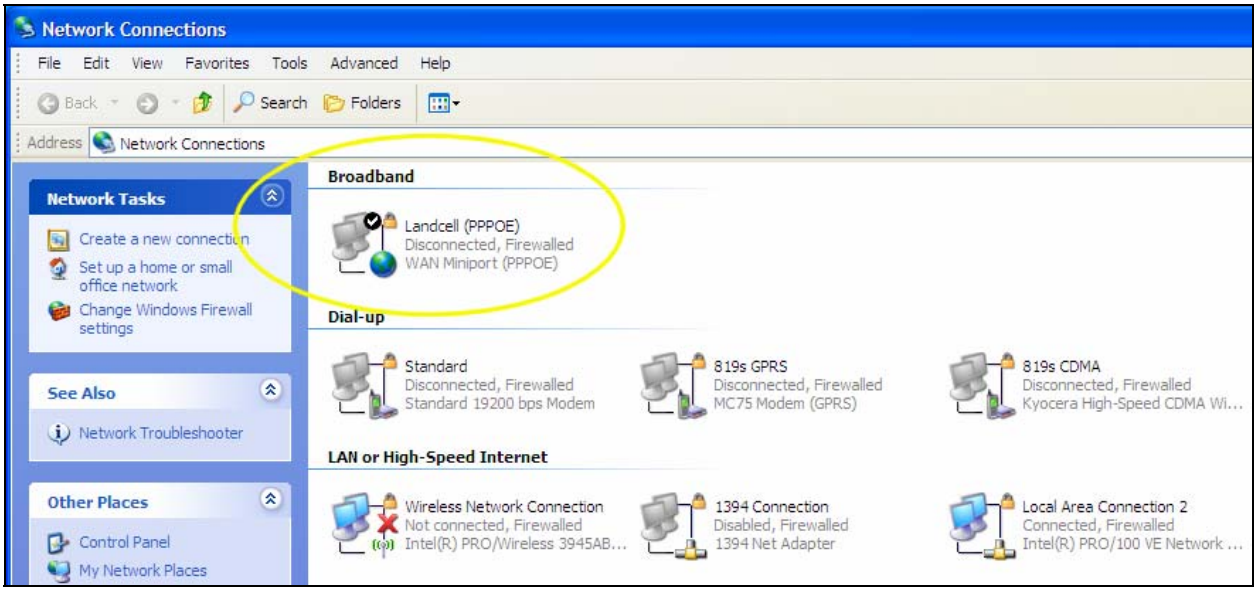


Figure 7.3: Network Connection with Broadband icon

Double clicking on the broadband icon will bring up the connection screen shown below in Figure 7.4.

Figure 7.4: PPPoE Connect screen

If a Username and Password are required, input them in the provided fields. Select "*Connect*" to initiate the login process to connect the modem to the carrier network using PPPoE.

To allow the PC LAN connection to access the modem's web interface, the TCP/IP Properties will need an IP address entered manually. This is because the DHCP server is disabled. Right click on the Local LAN connection icon and select "*Properties*". Refer to Figure 7.5 below.

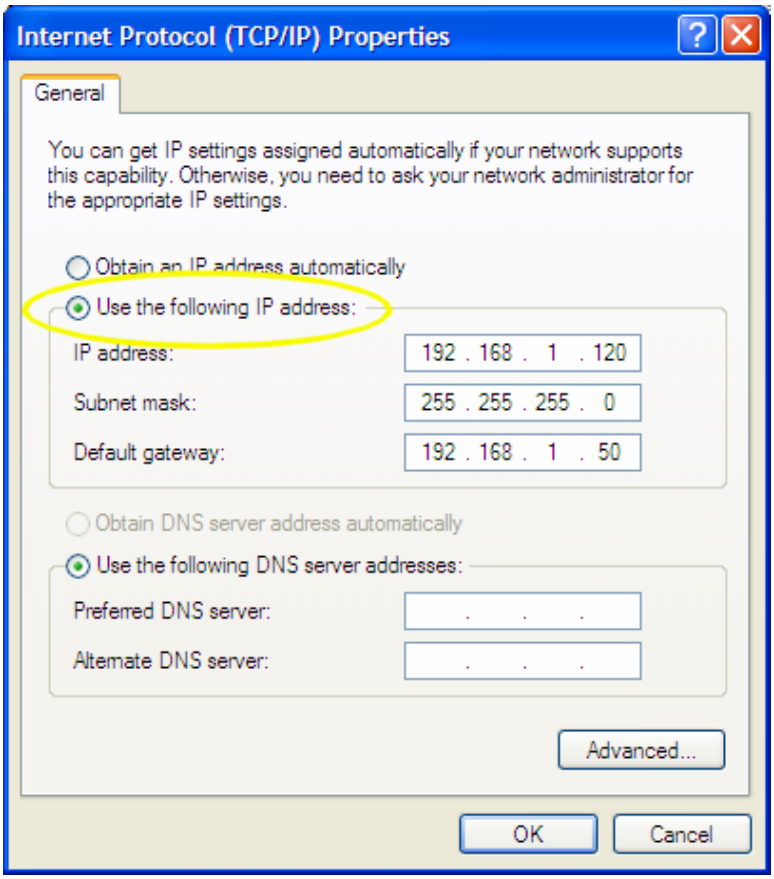


Figure 7.5 TCP/IP Properties

If PPPoE is disabled and the DHCP server is re-established in the modem, remember to select "*Obtain an IP address automatically*" at this screen. This will allow the modem to set the IP address of the LAN connection.

Remote Administration

Remote Configure:
Selecting Enable will allow remote access to the modem's configuration screens through the cellular network connection. Selecting Disable will shut off the ability to remotely access the modem's configuration screens.

Incoming Port:
This sets the port number used to remotely configure the modem. The default port is set to 8080.

Admin Password:
This sets the password required for remote configuration accessibility.

Confirm Password:
Re-type the Admin Password to confirm the correct spelling.

SECTION 8 – PORT FORWARDING SETTINGS

Selecting **Port Forwarding** from the left menu bar brings up the Port Forwarding configuration page. Port Forwarding is a technique for transmitting and receiving network traffic through a router that involves re-writing the source and/or destination IP addresses and usually the TCP/UDP port numbers of IP packets as they pass through. The various routing configurations will be displayed in the IP mapping table at the bottom of the screen. Refer to Figure 8.1 below.

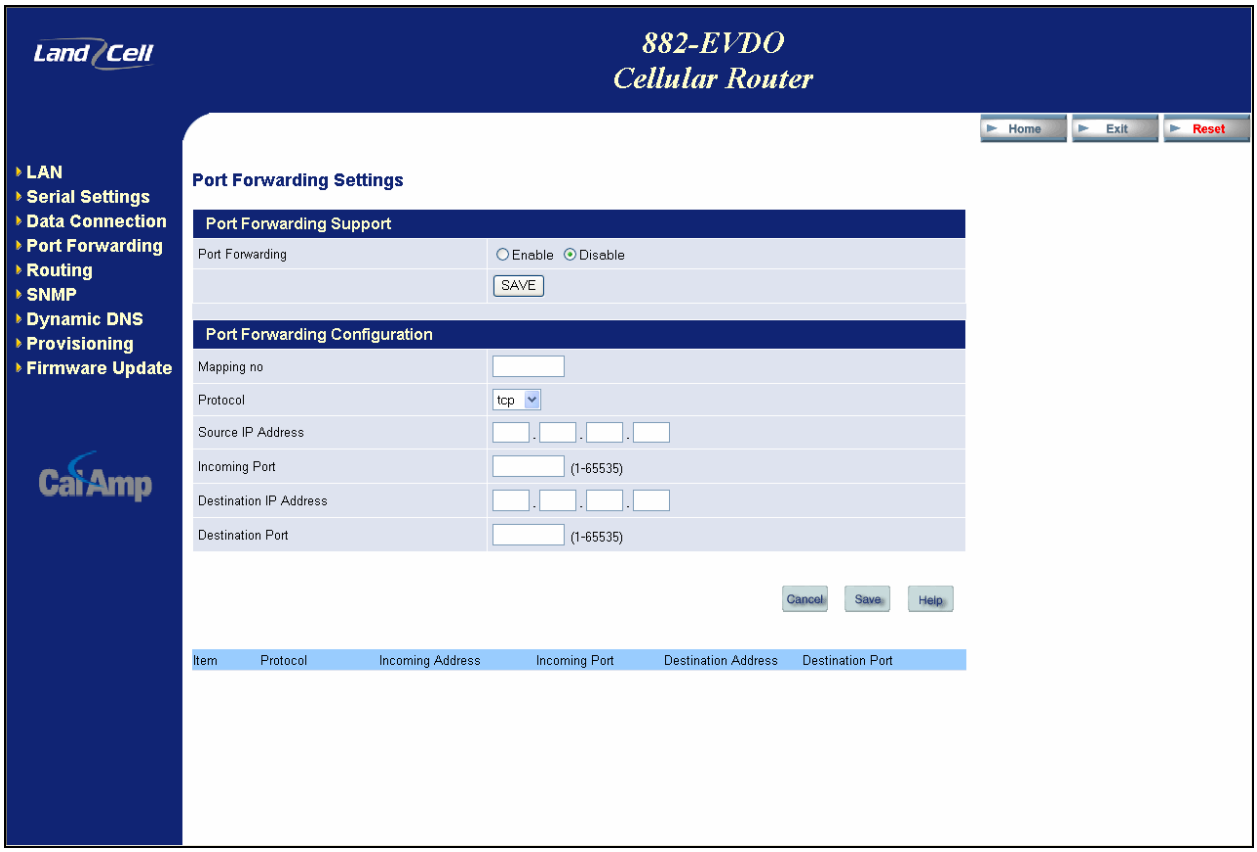


Figure 8.1: Port Forwarding configuration page

Port Forwarding Support

Port Forwarding Enable:
When set to Enable, will allow the modem to use the Port Forwarding routes described in the IP mapping table. When set to Disable, will shut down the Port Forwarding functionality. The **SAVE** button must be pressed for changes to take effect.

Port Forwarding Configuration

Mapping No:
This sets the Mapping Number for the IP mapping table at the bottom of the screen. The mapping numbers must be listed in sequential numerical order starting with 1 (i.e. 1, 2, 3 …).

Protocol:
This sets the data protocol as either *tcp*, *udp*, or *all*.

Source IP Address:
This specifies an IP address that is allowed to access the modem or a wildcard IP address of 0.0.0.0 that allows all IP address to access the modem.

Incoming Port:
This sets the external port number for incoming requests.

Destination IP Address:
This sets the Local Area Network Address of the device connected to the modems Ethernet Jack. Inbound requests will be forwarded to this IP address.

Destination Port:
This sets the Local Area Network port number used when forwarding to the destination IP address.

As an example, if it were required that all incoming addresses using port 81 and 8081 be routed to IP address 192.168.1.222 on port 80 then the following information would be entered.

First, set the mapping number to 1, set the protocol to *all*, set the source IP address to 0.0.0.0 and the incoming port to 81, set the destination IP address to 192.168.1.222 and the destination port to 80, then click the SAVE button. This will set the first entry in the table as Item 1.

To route port 8081 as well, enter a mapping number of 2, set the protocol to *all*, set the source IP address to 0.0.0.0 and the incoming port to 8081, then set the destination IP address and port to the same values as before and click the SAVE button. A second entry will be created as item 2, shown in Figure 8.2 below.

Item	Protocol	Incoming Address	Incoming Port	Destination Address	Destination Port	
1	2	0.0.0.0	81	192.168.1.222	80	Delete Entry
2	2	0.0.0.0	8081	192.168.1.222	80	Delete Entry

Figure 8.2: Port Forwarding Mapping Table example 1

As a second example, add the requirement to forward information from IP address 192.168.2.100, port 8083 to IP address 192.168.1.223, port 8083 using the tcp protocol.

Enter a mapping number of 3, set the protocol to *tcp*, set the source IP address to 192.168.2.100 and the incoming port to 8083, then set the destination IP address to 192.168.1.223 and the destination port to 8083, then click the SAVE button. A third entry will be created as item 3, shown in Figure 8.3 below.

Item	Protocol	Incoming Address	Incoming Port	Destination Address	Destination Port	
1	2	0.0.0.0	81	192.168.1.222	80	Delete Entry
2	2	0.0.0.0	8081	192.168.1.222	80	Delete Entry
3	0	192.168.2.100	8083	192.168.1.223	8083	Delete Entry

Figure 8.3: Forwarding Mapping Table example 2

SECTION 9 – ROUTING

Selecting **Routing** from the left menu bar brings up the routing configuration page. The Routing screen is used to enable or disable Routing Information Protocol (RIP) and Virtual Router Redundancy Protocol (VRRP) routing. Static route tables are also created from the Routing screen and appear at the bottom. Static Routing refers to a manual method used to set up routing between networks.

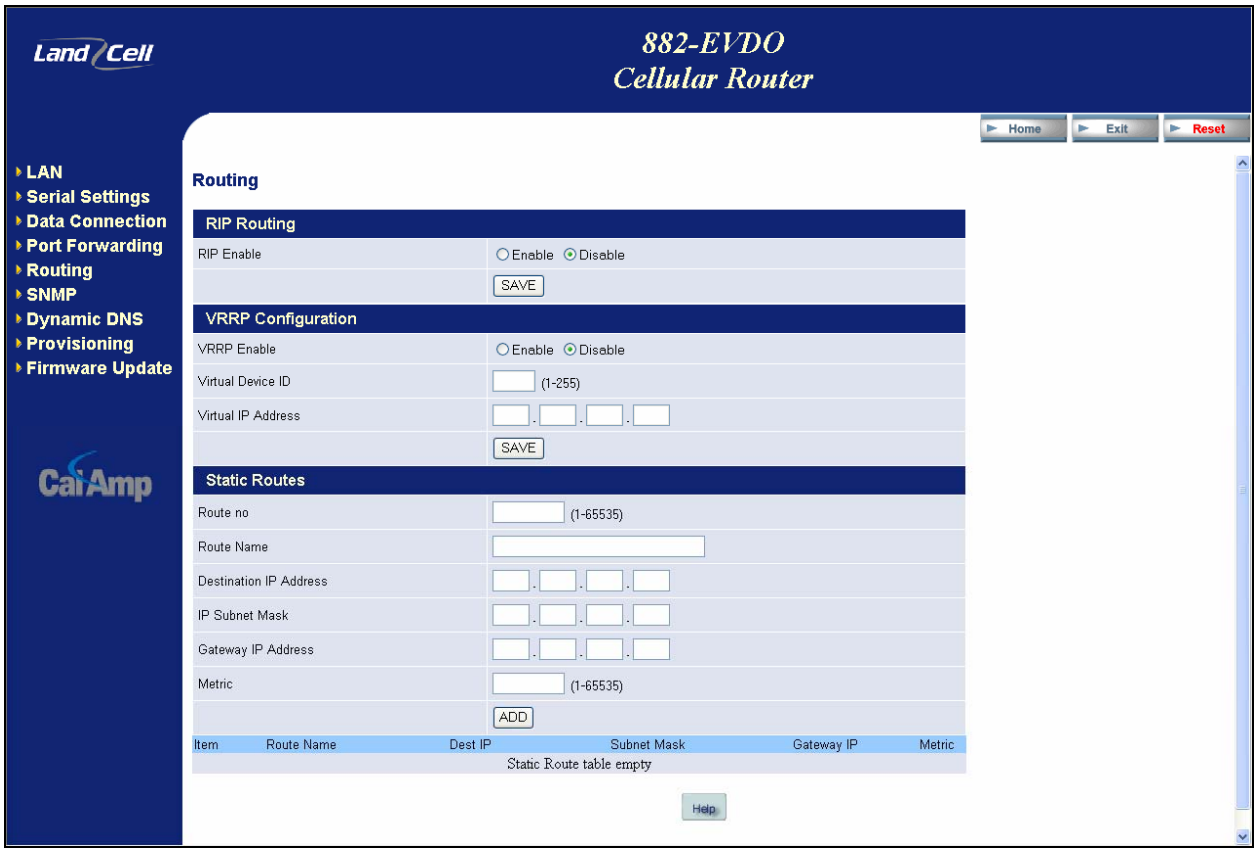


Figure 9.1: Routing configuration page

RIP Routing

RIP Enable:
Selecting Enable will allow the RIP functionality. Selecting Disable will shut off RIP functionality. RIP allows the router to dynamically adapt to changes in network connections by communicating information about which networks each router can reach and how far away those networks are. The SAVE button must be pressed for changes to take effect.

VRRP Configuration

VRRP Enable:
Selecting Enable will allow the VRRP functionality. Selecting Disable will shut off VRRP functionality. VRRP specifies an election protocol that dynamically assigns responsibility for a virtual router to one of the VRRP routers on a LAN. The SAVE button must be pressed for changes to take effect.

Virtual Device ID:
This sets the virtual device numeric identifier, ranging from 1 to 255.

Virtual IP Address:
This sets the Ethernet IP address of the virtual device.

Static Routes

Route No:
This sets the Static Route Table entry number value, ranging from 1 to 65,535. The Static Route entries must start with 1 and be incremented by 1 for each additional entry.

Route Name:
This sets the alphanumeric identifier of the static route in the Static Route Table.

Destination IP Address:
This sets the IP address of the destination network.

IP Subnet Mask:
This sets the subnet mask of the destination network.

Gateway IP Address:
This sets the local network IP address for the gateway to the destination network.

Metric:
Number ranging from 1 to 65,535. The lower the metric value the higher the route priority.

The ADD button must be pressed to add the configured route to the Static Route Table.

As an example, if a router connected on the Ethernet side of the modem has a gateway IP address of 192.168.1.2 and is interfaced to network 192.168.2.0 the following would be entered in the Static Route Table to allow a device to get on the 192.168.2.0 network.

Set the Route Number to 1, name the Route (i.e. route1), set the destination IP Address to 192.168.2.0, set the IP Subnet Mask to 255.255.255.0, set the Gateway IP Address to 192.168.1.2, and set the Metric to 1. The following entry will be made in the Static Route Table:

Item	Route Name	Dest IP	Subnet Mask	Gateway IP	Metric	
1	route1	192.168.2.0	255.255.255.0	192.168.1.2	1	Delete Entry

Figure 9.2: Static Route Table example

SECTION 10 – SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)

Selecting **SNMP** from the left menu bar brings up the Simple Network Management Protocol configuration page. SNMP is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention. SNMP version v1 is supported.

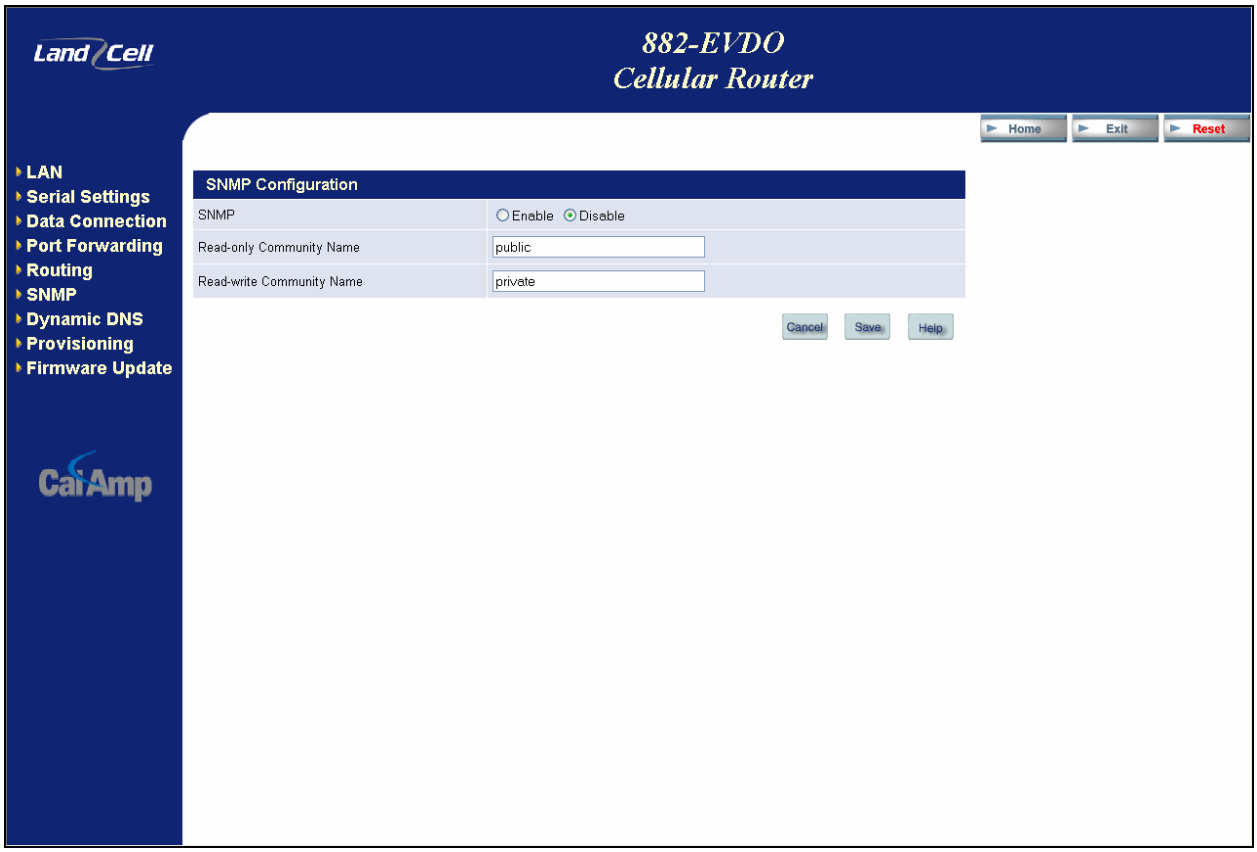


Figure 10.1: SNMP configuration page

SNMP Configuration

SNMP:
Selecting Enable will allow the SNMP functionality. Selecting Disable will shut off SNMP functionality.

Read-only Community Name:
The community string used for accessing the read-only Management Information Bases (MIBs).

Read-write Community Name:
The community string used for accessing all Management Information Bases (MIBs) including writable MIBs.

SECTION 11 – DYNAMIC DNS

Selecting **Dynamic DNS** from the left menu bar brings up the Simple Dynamic DNS configuration page. Dynamic DNS is a system which allows the domain name data held in a name server to be updated in real time. This allows an Internet domain name to be assigned to a device with a varying (dynamic) IP address. This makes it possible for other sites on the Internet to establish connections to the machine without needing to track the IP address themselves. A number of third party providers offer Dynamic DNS services ("DDNS") free or for a charge. For example, a free service provided by “No-IP" allows users to setup between one and five host names on a domain name provided by No-IP.

Figure 11.1: Dynamic DNS configuration page

NO-IP Configuration

NO-IP:
Selecting Enable will allow the modem to provide the NO-IP service dynamic IP address information. Selecting Disable will stop any IP information from being sent to the NO-IP service.

User at NO-IP.com:
The username used when setting up the NO-IP.com account. This username is used to login to the NO-IP.com service.

NOIP Password:
The password associated with the NO-IP.com username account.

Hostname:
The hostname identified to the NO-IP.com service, for example http://test.myserver.com. This hostname is used to access the web information at the associated carrier IP address.

Update Interval:
Sets the interval, in minutes (0 to 65,535), the modem will update the NO-IP server of its carrier assigned IP address. It is recommended to set this interval as long as necessary. Each update is considered a data call by the cellular provider and could deplete low usage data plan minutes.

A No-IP service account can be set up at www.no-ip.com. There are several managed DNS service account packages available as.

SECTION 12 – FIRMWARE UPDATE

Selecting **Firmware Update** from the left menu bar brings up the firmware status and upgrade page. When newer versions of the modem firmware become available, the user can download the proper file from the CalAmp web site (www.calamp.com) and manually update the unit. The update file is named **upgrade.tar.gz** and is specific to each unit's model number.

Figure 12.1: Firmware Update page

Current Firmware Information

Version:
Displays the modem firmware version currently loaded in the unit.

Download New Firmware

File:
This is the input field for the **upgrade.tar.gz** file used to update the modem. The Browse button can be used to locate the file from a specific folder after it has been downloaded from the web site. The update can be done remotely if Remote Administration is enabled.

Progress:
Displays the update progress after the Save button has been pressed.

NOTE: All user parameter values previously setup for the modem will be lost and set to factory default parameter values when the firmware is updated. Please record all modem parameters prior to an update.

SECTION 13 – SERIAL SETTINGS

Selecting **Serial Settings** from the left menu bar brings up the Serial Port and PAD settings page. The Serial Settings screen is used to configure the RS232 Serial Port parameters and Packet Assembler and Dis-assembler (PAD) functionality. The PAD feature forwards requests coming in on a specific port to the Serial connector. Refer to Figure 13.1 below.

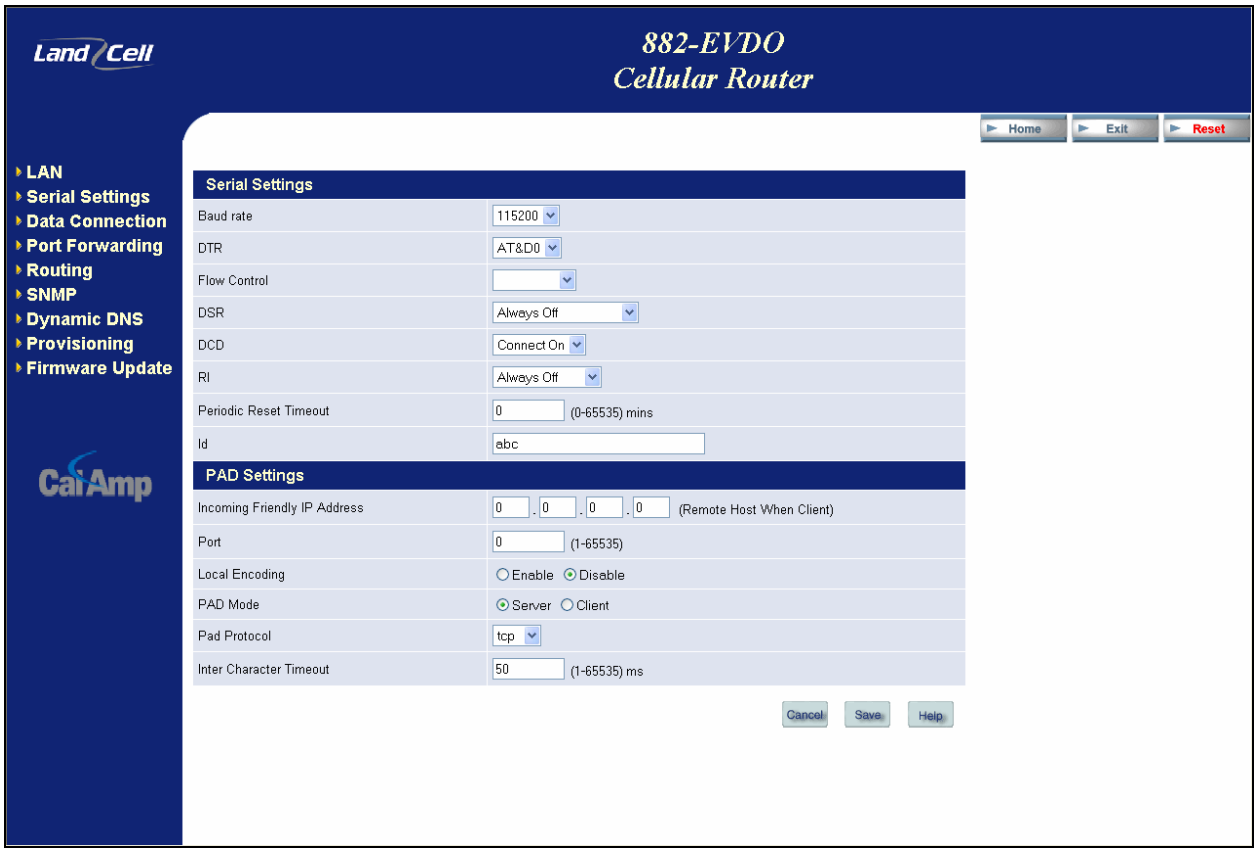


Figure 13.1 Serial Settings page

Serial Settings

Baud Rate:
This sets the baud rate of the serial port. Settings may range from *300* to *115,200* bits per second. The default baud rate is 115,200 bps.

Inter Character Timeout:
This sets the Inter Character Timeout from 1 to 65,535 ms.

DTR:
This sets the Data Terminal Ready as *AD&D0* thru *AD&D7*. The default DTR is set to AD&D0.

Flow Control:
This sets the Flow Control to *None* or *Hardware* control.

DSR:
This sets the Data Set Ready to *Always On*, *On When Available*, *On When Connected*, or *Always Off*.

DCD:
This sets the Data Carrier Detect to *Always On*, *Connect On*, or *Always Off*.

RI:
This sets the Ring Indicator *to Always On*, *Incoming Ring*, or *Always Off*.

Periodic Reset Timeout:
This sets the Periodic Reset Timeout from 0 to 65,535 ms.

Id:
This sets an alphanumerical Identifier for the serial connection.

PAD Settings

Incoming Friendly IP Address:
This sets the IP address of the device using the PAD functionality.

Port:
This sets the port number used for forwarding requests to the serial port.

Local Encoding:
Select buttons to Enable or Disable local encoding of the data packet.

PAD Mode:
Select buttons to set the PAD mode of the modem as a Server or Client. Server mode is commonly selected when the modem is providing the interface via the RS232 port.

Pad Protocol:
This sets the data protocol for the PAD to *tcp* or *udp* data.

SECTION 14 – SERIAL INTERFACE COMMUNICATION

Many of the modem features available using the web interface can also be accessed via the RS232 serial interface. Table 14.1 lists the various serial AT commands that can be used to configure and operate the modem via the serial port.

Table 14.1: Serial AT Commands

Command	**Description**
AT+LCPAST	=1 Configures the serial Terminal Emulator to direct recognized AT commands to the cell module, as opposed to the modem-emulator of the unit. Note: The Default Value of this setting is AT+LCPAST=0 =2 Configures the serial Terminal Emulator to direct all AT commands to the cell module, as opposed to the modem emulator of the unit. Note: This mode can only be exited by power-cycling the modem.
Dialing Related Commands	
AT+LCGASC	Active Connection: ? Displays current active profile connection. =0 Terminates the connection and prevents further attempts during the current session. =1 This command tells the modem to dial out using the settings of profile 1. It will automatically redial if the connection is dropped.
AT+LCIFCG?	Displays “eth0” and “ppp0” connection information. “eth0” are the statistics for the Ethernet jack and “ppp0” are statistics for the modems PPP connection via the antenna IP. If you do not see the “ppp0” section you are not actively connected.
AT+LCPRT	Periodic Reset Timeout ? Displays current timer setting. =0 Disables timer (default). =*n* Sets the modem to reboot once every *n* minutes.
Serial Commands	
AT+LCPRFL	Dialing Profile: ? Displays the current profile settings. =<ProfileNumber>,<Number>,<UserName>,<Password>,<Transport>,<Mode>,<IPAddress>,<Port> <ProfileNumber> Usually **1** <Number> Phone number to dial. Defualt is **ATD#777** <UserName> User Name if required to login to 1xRTT. Do not leave blank, use a single space if no username, <Password> Password if required to login to 1xRTT Do not leave blank, use a single space if no password. <Transport> **0 = TCP, 1 = UDP** <Mode> **0** :Modem acts as client, **1** :Modem acts as server. <Local Encoding> Always set to **0** <IP Address> The IP To Connect To When Acting As A Client , or the Trusted Incoming IP To Listen To When Acting As Server. A wildcard value of 0.0.0.0 will allow any incoming IP address access. <Port> Port To Connect To When Acting As A Client. Trusted Incoming Port To Listen To When Acting As A Server. Traffic on this port is forwarded to the DE-9 serial connector of the modem and converted to ASCII by stripping off the TCP/IP Headers and adding TCP headers to outgoing ASCII strings. This is called PAD (“Packet Assembler/Dissassembler”).
AT+LCICTO	Sets the inter-character timer. Default is **50 ms**.

Serial Port Configuration Commands	
AT+IPR	Serial Port baud rate: ? Displays current baud rate =*n* Sets the baud rate to value of *n*. Default value is **115200**.
AT+IFC	Hardware Flow Control: ? Displays current setting =0,0 No Flow Control =1,1 Xon/Xoff =2,2 Hardware
AT&D*n*	DTR Configuration: This parameter determines how the modem responds when the Data Terminal Ready circuit changes state. Default value **AT&D0**. AT&D0 Ignore DTR. AT&D1 If in the Online Data State, upon an on-to-off transition of DTR, the modem enters Online Command State and issues an OK result code; the call remains connected. Otherwise, ignore DTR. AT&D2 If in the Online Data State or Online Command State upon an on-to-off transition of DTR, the modem performs an orderly clear-down of the call and returns to the command state. Automatic answer is disabled while DTR remains off. AT&D4 The modem auto-dials the default remote station (as determined by AT+LCPRFL) upon an off-to-on transition of DTR and enters the Online Data State. The modem ends the call and enters the command state upon an on-to-off transition of DTR. AT&D5 The modem auto-dials the default remote station (as determined by AT+LCPRFL) upon an on-to-off transition of DTR and enters the Online Data State. The modem ends the call and enters the command state upon an off-to-on transition of DTR. AT&D6 Upon an on-to-off transition of DTR, the modem performs an orderly clear-down of any session and turns OFF the RF module. Upon an off-to-on transition of DTR, the modem turns ON the RF module and reestablishes the radio session as determined by the AT+LCGASC setting. AT&D7 Upon an on-to-off transition of DTR, the modem performs an orderly clear-down of any session and turns OFF the RF module. Upon an off-to-on transition of DTR, the modem turns ON the RF module and reestablishes the radio session. AT&D8 Upon an on-to-off transition of DTR, the modem performs an orderly clear-down of any session and turns OFF the RF module. Upon an off-to-on transition of DTR, the modem turns ON the RF module and reestablishes the radio session and auto-dials the default remote station (as determined by AT+LCPRFL)
AT&R*n*	RTS Configuration: This parameter determines how the modem responds when the Request To Send circuit changes state. The state of this parameter may be affected by the state of the +IFC parameter and vise versa, the last issued command takes precedence. Default value **AT&R0** AT&R0 Ignore RTS. AT&R2 RTS Flow Control, if RTS is off the terminal will not send data to the host.

AT&S*n*	DSR Configuration: This parameter determines how the modem controls the state of the Data Set Ready circuit. Default value **AT&S0**. AT&S0 DSR always ON. AT&S1 DSR ON when the RF signal present and phone registered on network. AT&S2 DSR ON when connected to CDMA. AT&S3 DSR always OFF. AT&S4 DSR controlled via I/O control feature.
AT&Q*n*	CTS Configuration: This parameter determines how the modem controls the state of the Clear to Send circuit. Default value **AT&Q0**. AT&Q0 CTS always ON. AT&Q1 CTS always OFF. AT&Q2 CTS flow control, terminal sets CTS low if it is unable to accept data from host. AT&Q3 CTS follows state of RTS. AT&Q4 DSR Controlled via I/O control feature.
AT&C*n*	DCD Configuration: This parameter determines how the modem controls the state of the Carrier Detect circuit. Default value **AT&C1**. AT&C0 DCD always ON. AT&C1 DCD ON when connected to remote host. AT&C2 DCD always OFF. AT&C3 DSR controlled via I/O control feature.
AT&N*n*	RI Configuration: This parameter determines how the modem controls the state of the Ring Indicator circuit. Default value **AT&N1**. AT&N0 RI always ON. AT&N1 RI tracks incoming ring pulse. AT&N2 RI always OFF. AT&N3 RI controlled via I/O control feature. AT&N4 RI acts as watchdog output (changes state once per second under normal conditions).

Ethernet Related Commands	
AT+LCETHI	Modem's IP Address: ? Displays current IP address. =x.x.x.x Sets the modem's IP address (default: **192.168.1.50**).
AT+LCETHN	Modem's Subnetmask: ? Displays current subnetmask. =x.x.x.x Sets the modem's subnetmask (default: **255.255.255.0**).
AT+LCDHCP	DHCP Server Settings: ? Displays the current settings. =0 Turns off the DHCP server. =<DHCPStartAddress>,<DHCPEndAddress>,<LeaseTime>,<DNS1>,<DNS2>
AT+LCMAPP	Port Forwarding Settings: ? Displays the current settings. =<Profile>,<Protocol>,<ExternalIPAddr>,<ExternalPort>,<InternalIPAddr>,<LocalPort>
AT+LCPPPOE	PPPoE Connection: ? Displays the current settings. =0 Disable PPPoE =1 Enable PPPoE

SECTION 15 – SPECIFICATIONS

Product specifications are subject to change without notice.

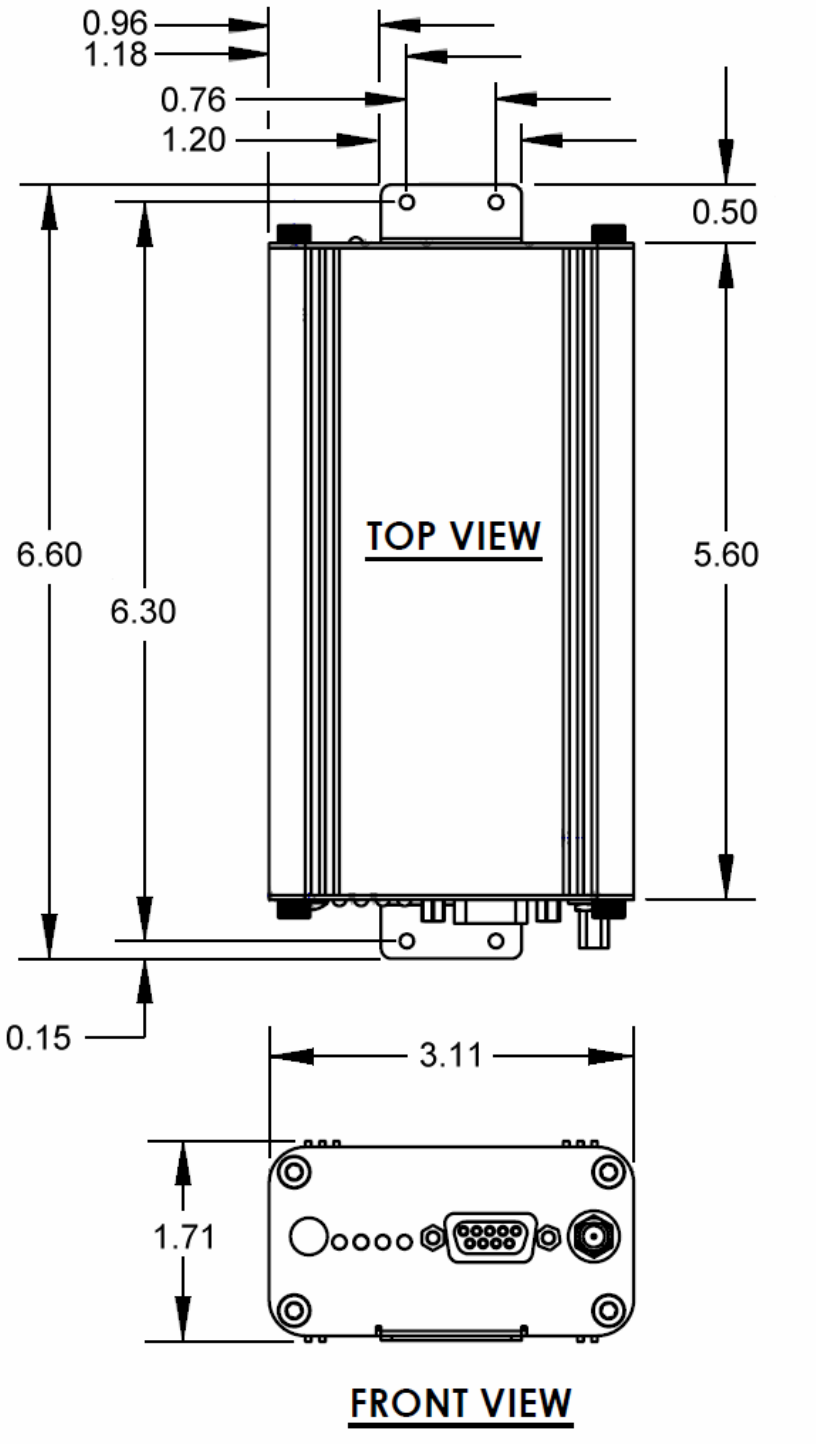
General Specifications

Interface Connectors:	RS-232 DE-9S Connector (DCE) 10/100 Base-T Full Duplex USB Host Controller
Power Connector:	2.1mm/5.5mm DC Barrel Jack (Center Positive)
LED Indicators:	SVC-TYPE, TX/RX, DCD, RSSI
Antenna Interface:	SMA female
Size:	5.60 x 3.11 x 1.71 in.
Weight:	10.0 oz.
Power Input:	9.0 – 28VDC 1.7 W; 140 mA @ 12 VDC (average idle) 9.0 – 28VDC 3.8 W; 320 mA @ 12 VDC (peak active 822-1XRT) 9.0 – 28VDC 6.5 W; 550 mA @ 12 VDC (peak active 882-EVDO)
Maximum TX Power:	CDMA: +23.5 dBm min. / +22.5 dBm min (1900MHz)
Rx Sensitivity:	CDMA: >-104 dBm
Frequencies:	Cellular: TX: 824-849 MHz Rx: 869-894 MHz PCS: TX: 1850-1910 MHz Rx: 1930-1990 MHz
Temperature:	Operating: -30°C to +60°C (-22° to 140°F) 100% Duty Cycle Storage: -55°C to +85°C (-67° to 185°F)
Emissions:	FCC Part 15B
Transport Protocols:	UDP/TCP
Command Protocol:	Web interface, Command line v.250 AT, & proprietary
Certifications:	
822-1XRT	CDG 2, Tested and approved FCC ID: RD5-LCC0308 Industry Canada ID: IC: 418A-LCC0308
882-EVDO	CDG 2, Carrier approvals pending FCC ID: N7N-MC5725 Industry Canada ID: IC: 2417C-MC5725

NOTE: Power consumption while transmitting is dependant on the TX power level of the cellular module. The TX power level of the module is controlled by the cellular base station.

Mechanical Specifications

The following section describes in detail the exterior dimensions of the 822-1XRT/882-EVDO modem and how to utilize the mounting flanges to secure the modem to any surface, which can be drilled for such a purpose. The drawings may be used as layout reference, but it is advised that a physical comparison be made to the modem before proceeding with the mounting process.



All dimensions in inches.

SECTION 16 – ABBREVIATIONS

Abbreviation	Description
CDMA	Code Division Multiple Access
CTS	Clear to Send
DCD	Data Carrier Detect
ESN	Electronic Serial Number
EVDO	Evolution Data Optimized
GPRS	General Packet Radio Service
GPS	Global Positioning System
IOTA	Internet Over the Air
LED	Light Emitting Diode
OTA	Over the Air
OTASP	Over the Air Service Provisioning
PPP	Point to Point Protocol
PRL	Preferred Roaming List
RSSI	Receive Signal Strength Indication
Rx	Receive
Tx	Transmit

SECTION 17 – SERVICE AND SUPPORT

Product Warranty, RMA and Contact Information

CalAmp guarantees that every 822-1XRT/882-EVDO Cellular Modem will be free from physical defects in material and workmanship for one (1) year from the date of purchase when used within the limits set forth in the Specifications section of this manual.

The manufacturer's warranty statement is available in Appendix 1. If the product proves defective during the warranty period, contact CalAmp DataCom Customer Service to obtain a Return Material Authorization (RMA).

RMA Request

Contact Customer Service:
Dataradio dba CalAmp Wireless DataCom
299 Johnson Avenue, Suite 110
Waseca, MN 56093
Tel: 507-833-8819 ext. 6707
Fax: 507-833-6748

BE SURE TO HAVE THE EQUIPMENT MODEL AND SERIAL NUMBER, AND BILLING AND SHIPPING ADDRESSES ON HAND WHEN CALLING.

When returning a product, mark the RMA clearly on the outside of the package. Include a complete description of the problem and the name and telephone number of a contact person. RETURN REQUESTS WILL NOT BE PROCESSED WITHOUT THIS INFORMATION.

For units in warranty, customers are responsible for shipping charges to CalAmp Wireless DataCom. For units returned out of warranty, customers are responsible for all shipping charges. Return shipping instructions are the responsibility of the customer.

Product Documentation

CalAmp reserves the right to update its products, software, or documentation without obligation to notify any individual or entity. Product updates may result in differences between the information provided in this manual and the product shipped. For the most current product documentation, visit www.calamp.com for datasheets, programming software and user manuals.

Technical Support

M-F 7:30 AM to 4:30 PM CDT

CalAmp Wireless DataCom
299 Johnson Avenue, Suite 110
Waseca, MN 56093
Tel: 507-833-8819
E-mail: supportIMC@calamp.com

APPENDIX 1 – WARRANTY STATEMENT

CalAmp DataCom warrants to the original purchaser for use ("Buyer") that data telemetry products manufactured by DRL ("Products") are free from defects in material and workmanship and will conform to DRL's published technical specifications for a period of, except as noted below, one (1) year from the date of shipment to Buyer. DRL makes no warranty with respect to any equipment not manufactured by DRL, and any such equipment shall carry the original equipment manufacturer's warranty only. DRL further makes no warranty as to and specifically disclaims liability for, availability, range, coverage, grade of service or operation of the repeater system provided by the carrier or repeater operator. Any return shipping charges for third party equipment to their respective repair facilities are chargeable and will be passed on to the Buyer.

If any Product fails to meet the warranty set forth above during the applicable warranty period and is returned to a location designated by DRL. DRL, at its option, shall either repair or replace such defective Product, directly or through an authorized service agent, within thirty (30) days of receipt of same. No Products may be returned without prior authorization from DRL. Any repaired or replaced Products shall be warranted for the remainder of the original warranty period. Buyer shall pay all shipping charges, handling charges, fees and duties for returning defective Products to DRL or DRL's authorized service agent. DRL will pay the return shipping charges if the Product is repaired or replaced under warranty, exclusive of fees and duties. Repair or replacement of defective Products as set forth in this paragraph fulfills any and all warranty obligations on the part of DRL.

This warranty is void and DRL shall not be obligated to replace or repair any Products if (i) the Product has been used in other than its normal and customary manner; (ii) the Product has been subject to misuse, accident, neglect or damage or has been used other than with DRL approved accessories and equipment; (iii) unauthorized alteration or repairs have been made or unapproved parts have been used in or with the Product; or (iv) Buyer failed to notify DRL or DRL's authorized service agent of the defect during the applicable warranty period. DRL is the final arbiter of such claims.

THE AFORESAID WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. DRL AND BUYER AGREE THAT BUYER'S EXCLUSIVE REMEDY FOR ANY BREACH OF ANY OF SAID WARRANTIES IT AS SET FORTH ABOVE. BUYER AGREES THAT IN NO EVENT SHALL DRL BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES WHETHER ON THE BASIS OF NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. The purpose of the exclusive remedies set forth above shall be to provide Buyer with repair or replacement of non-complying Products in the manner provided above. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as DRL is willing and able to repair or replace non-complying Products in the manner set forth above.

This warranty applies to all Products sold worldwide. Some states do not allow limitations on implied warranties so the above limitations may not be applicable. You may also have other rights, which vary from state to state.

EXCEPTIONS

ONE YEAR:	Labor to replace defective parts in repeaters or base stations
THIRTY DAY:	Tuning and adjustment of telemetry radios
NO WARRANTY:	Fuses, lamps and other expendable parts

Effective 1/2008